

STORAGE DEVICEField of the Invention

The present invention relates to a device or installation and a method for efficiently storing printed products.

5    Background Art

A well-known problem in the handling of printed products, such as newspapers and supplements to newspapers and the like, is that large numbers are printed in a short time, often more than 20 newspapers/second. There 10 is a great need for efficient and flexible solutions in connection with the handling of the products as they come from the printing machine before they are further distributed. There is also a need for intermediate storage of supplements that are to be inserted in a newspaper, while 15 the actual newspaper is being printed.

Various types of installations and methods are today used in the handling of printed products. In many printing plants, use is made of rolls onto which the printed products are wound as they arrive from the printing 20 machine. Once a roll is full, it is stored while waiting for further handling, and a new roll is arranged to receive the products. This method requires a great deal of manual handling, and because of the exchanges of rolls, the process must be interrupted at regular intervals. The smaller the rolls the more frequently the process must be interrupted, and the larger the rolls, the more complicated the handling. With the rolls stored vertically, the actual rolls often become oval, egg-shaped, after quite a short time. As a result, the products may 25 be bent. The rolls are further intended to be moved from the place where they have been filled with newspapers to a storage space and then back when the products are to be unwound from the rolls. This method makes extensive 30 intermediate handling necessary. Another problem that may

arise in this type of storing is smearing of printing ink between the printed copies, which means that some newspapers have to be discarded. Furthermore the above process is susceptible to the roll joints which arise in the 5 printing machine when the paper on which the newspaper is being printed has to be exchanged. When a newspaper with a printing joint is rolled up for storage, the entire process may have to be interrupted.

US 4,274,623 discloses an apparatus intended for 10 stacking of printed products. The products are advanced by means of a conveyor belt so as then to be stacked layer by layer by the apparatus rotating about its pivot. The pivot consists of a rod which is vertical relative to the base, which means that a helical "corncob-like" stack 15 is obtained.

US 4,000,806 discloses an apparatus for feeding printed products when they are stacked in a helical stack. The apparatus comprises a pivot around which the products are stacked. The apparatus is further provided 20 with a stationary opening through which the products pass when they are to be discharged from the stack. The stack of products is according to US 4,000,806 adapted to be arranged so that the pivot is vertical relative to the base.

25 The apparatus according to US 4,000,806 and US 4,274,623 comprise a pivot in the form of a rod around which the products are supplied, layer by layer. A problem with these apparatus is that they may hold a rather small number of products. The stacks are further adapted 30 to be moved from the place of stacking to a storage space and then back when the products are to be discharged from the stacks. This method necessitate extensive intermediate handling.

35 There is a need for an installation and a method that solve the above problems to be able to render effective and improve the handling of printed products, especially the storing of the same.

Summary of the Invention

An object of the present invention is to wholly or partly solve the above problems by providing an installation and a method which

5    • do not cause smearing of printing ink between the printed copies,

• do not bend the printed products when stored,

• are not susceptible to roll joints,

• do not require intermediate handling,

10    • are space-saving,

• ensure a continuous handling process without many interruptions,

• can handle quite large numbers of printed products,

• make the degree of utilisation optimal since a plurality of installations can be arranged in a system.

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According to the present invention, this object is achieved by an installation and a method for storing printed products in one or more layers, having the features as stated in claims 1 and 5, preferred embodiments 20 being defined by the dependent claims.

According to a first aspect of the invention, there is provided a method of storing printed products in one or more layers on at least one substantially circular conveyor track. This method of placing the products on 25 a circular conveyor track gives the advantage that there will be no movement between the copies, which means, inter alia, a considerable reduction of the risk that smearing of printing ink from one newspaper stains another. A further advantage is that the air is pressed 30 out from the printed products, which means that they are packed properly and that they will not be bent.

According to a second aspect of the present invention, there is provided a method of supplying printed products to the conveyor track at least at one point in 35 the track. The lowermost layer can be discharged from the conveyor track through an opening in the track. Printed products can be supplied to the track while at the same

time printed products are discharged from the track at the opening. These methods relating to the process of supplying and discharging products to/from the track are independent of each other, which means that the method

5 according to the present invention is flexible and can be adjusted entirely to the user's needs. A further advantage is that an even speed and reliable operation are achieved since just a few interruptions in the handling of the products have to be made.

10 In addition to the above-described methods, the invention also relates to a corresponding installation. According to a third aspect of the invention, there is thus provided an installation for storing one or more layers of printed products, comprising one or more conveyor tracks. Printed products are stored on a substantially circular conveyor track, said track being provided with at least one opening for discharge of the lowermost layer. The conveyor track comprises means which are adapted on the one hand to hold the lowermost layer on

15 the track and, on the other, to guide the lowermost layer away from the track through the opening. Moreover the means, when in a first position, bridges the opening, whereby the conveyor track is continuous. In one embodiment of the invention, the means is a flap which is mov-

20 ably arranged in the opening.

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The above installation corresponds to the methods according to the first and second aspects of the invention as discussed above, and advantages corresponding to those of the methods are achieved. A further advantage

30 of the installation according to the invention is that it is not susceptible to roll joints, which arise when the paper on which the newspaper is being printed runs out in the printing machine and the roll has to be exchanged. A separate conveyor supplies the newspapers to the track

35 which receives them without difficulties. If gaps arise in the flow of newspapers, for instance because newspapers with roll joints have been sorted out, this causes

no problem to the installation according to the invention, which continues working all the same.

Furthermore the invention comprises according to a fourth aspect an installation where the track is arranged with at least one edging, which is adapted to hold the printed products on the track. The installation is designed so that the products should stay on the track without the edging, but the advantage of the edging is that it constitutes an extra security function.

According to a fifth aspect of the invention, two or more tracks are arranged in a system. Two or more tracks can be arranged concentrically. At least one or more tracks can be arranged above a first track. The tracks operate independently of each other. The advantage of this is that two or more tracks can be arranged in a system in various ways. A plurality of tracks concentrically, a plurality of tracks above one another, or both concentrically and vertically. The tracks operate independently of each other but can be adjusted to each other, if required. The advantage of this is that a very flexible system is obtained and that the available floor surface is effectively utilised.

In general, the invention gives the advantage that a circular conveyor track can be used to store printed products in an advantageous manner, in respect of efficiency as well as quality of the products. The installation according to the invention can also be arranged in a system of several installations which are independent of each other. This results in a flexible system which can be adjusted to the user's needs and requirements and which can handle and store large numbers of printed products.

#### Brief Description of the Drawings

Fig. 1 is a top plan view of an installation according to the present invention,

Fig. 2A illustrates a detail of the installation in a first position, in a side view,

Fig. 2B illustrates a detail of the installation in a second position, in a side view,

Fig. 2C illustrates a detail of the installation in a second position, in a side view, where newspapers are 5 discharged from the track,

Fig. 3 illustrates several tracks arranged concentrically relative to each other, and

Fig. 4 illustrates several tracks arranged concentrically relative to each other, where the innermost 10 track has a plurality of layers of newspapers.

#### Description of Preferred Embodiments

The invention will now be described in more detail with reference to the schematic drawings, which illustrate an embodiment of the present invention.

15 The installation according to the present invention comprises a conveyor track, which is designated 1 in the drawings. For the sake of simplicity, the conveyor track 1 will below be referred to as the track. Moreover the installation comprises a conveyor 5 which supplies the 20 products to the track 1, a receiving conveyor 4 which receives the products as they are discharged from the track 1, see Fig. 1. The conveyors 4, 5 that are used in the invention are of the type that is used to handle printed products, known to a person skilled in the art.

25 The track 1 is adapted to store preferably newspapers, supplements and other similar printed products. The track 1 which is used according to the present invention is a conventional conveyor track known to a person skilled in the art. The track 1 can, for instance, be 30 driven by a motor 10 which via a gear 12 drives chains or the like included in the track 1. The supporting layer of the track 1 may consist of links made of plastic or like materials, conical rolls, overlapping plates or the like, according to prior-art technique. The technical solution 35 of the track 1 and the driving thereof constitute prior art and may be varied according to the user's needs and options.

The track 1 is substantially circular, but may also have a slightly deviating shape. By substantially circular is meant according to the invention circular  $\pm$  manufacturing tolerances. The circular shape of track 1 means

5 that no relative motion arises between the printed products that are stored on the track 1, which results in a considerable reduction of the risk of printing ink smearing between the printed copies.

The track 1 is arranged so as to provide an opening 2. The opposite sides in the opening 2 consist of sprockets or the like which drive the track 1, see Figs 2A-2C. A means 3 in the form of a flap or the like is movably arranged in the opening 2. In a first position, the flap 3 is lowered to the same level as the

10 track 1, see Fig. 2A. In this position the track 1 is continuous and extends advantageously through  $360^\circ$   $\pm$  manufacturing tolerances. In a second position, the flap 3 is raised, see Figs 2B-2C. In this second position, the track 1 is emptied of printed products through

15 the opening 2. Then the printed products reach a receiving conveyor 4 or some other suitable device.

In one embodiment of the present invention, the flap 3 is wedge-shaped, seen from the side, as it is mounted according to the invention, see Figs 2A-2C. The flap 3 further has a flat upper side, the side of the flap which is in level with the track 1, see Figs 2A, 3 and 4. Owing to the flat upper side of the flap 3, the flow of newspapers will not be obstructed, but may easily pass the flap 3 (when the flap 3 is in its first position). The

20 front edge 6 of the flap is straight and designed so as not to interfere with the flow of newspapers and, for instance, hit the spine of a newspaper and bend the newspaper. In another embodiment, the front edge 6 of the flap may be designed as a blunt arrow (not shown), for

25 the same purpose as stated above.

The flap 3 is provided with smooth polished surfaces so as to be able to deflect the flow of printed products

without disturbing the flow. The flap 3 is advantageously made of stainless steel or some other material with similar properties. The size of the flap 3 should correspond approximately to the width of the printed products that are to be conveyed and stored on the track 1, for instance the width of a newspaper, and be slightly smaller than the opening 2. The flap 3 is movably suspended from one of the drive shafts of the track 1, said drive shafts constituting the opposite sides of the opening 2, see Figs 2A-2C.

The flap 3 further is mobile and adapted to operate rapidly between the first and the second position. The flap 3 moves up and down preferably by means of a pneumatic cylinder (air cylinder). The flap 3 can also move by means of a hydraulic cylinder, be electrically driven, be driven by a servomotor, move by means of pull-type electromagnets or like technique which is known to a person skilled in the art.

The printed products are supplied to the track 1 by means of a tangentially arranged conveyor 5 which is arranged above the track 1. The conveyor 5 supplies the products straight in the track of the tangent, see Fig. 1. The conveyor 5 can be placed anywhere in the track 1, except in direct connection with the opening 2. This results in great freedom as to the design of the installation according to the invention. The conveyor 5 is vertically adjustable so as to follow the stack of products as it grows or falls.

When the products are supplied to the track 1, they are placed with a newspaper overlap of usually between 40 and 50 mm (overlap = how much the newspapers overlap each other). The overlap may be varied as required and depends, inter alia, on the speed at which the track 1 is run. The track 1 is run at a speed corresponding to the supplying conveyor 5, usually about 60 m/min. A track 1 according to the invention holds a considerable number of printed products. The greater the diameter of the track

1, the greater volume of printed products can be stored. For example, a track with a diameter of 12 m can store about 30,000 printed products. The maximum height for a track is about 0.5 m, the stack with printed products 5 being higher at the inner edge of track 1 than at the outer edge of track 1, according to a fan effect.

The product that is first supplied to the track 1 is first discharged from the track, which means that the lowermost layer is discharged first. The track 1 can be 10 emptied of a desired number of a printed products through the opening 2 and after that the flap 3 can be lowered. It is possible to merely fill or merely empty the track 1, or to fill as well as empty the track 1 at the same time, which means that the processes of supplying and 15 discharging products are fully independent of each other. When products are stored on the track 1, the desired number of products are supplied to the track, after which the process is stopped. When later the entire, or parts of, the stock is to be discharged, the flap 3 is opened 20 (put in its second position) and the track 1 is started.

A plurality of tracks 1 can be arranged in a system. The tracks 1 then operate quite independently of each other. A plurality of tracks 1 can, for example, be arranged freely one above the other in some kind of frame 25 (not shown), according to prior art. With different diameters of the tracks, they can also be arranged inside and outside each other, concentrically, which means that a large system that can handle large numbers of printed products can be constructed if desired, see Figs 3 and 4. 30 In a system with a plurality of tracks, one conveyor is advantageously used for each track 1. In another embodiment, it is possible to have the same conveyor for all or some tracks 1, but this reduces the flexibility and the independence between the tracks 1.

35 The installation according to the invention can be arranged on the first floor, or higher, as one or more entresols. In this way it is possible to use the surface

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under the installation, which means that quite a lot of space will be saved.

The track 1 can also be provided with one or more edgings (not shown) to prevent the products from leaving 5 the track 1. The edging can be arranged at the inner edge or outer edge of the track 1, or at the inner as well as outer edge. The track 1 is arranged so that the products should stay on the track 1 also without an edging, but one or more edgings can be considered an extra security 10 function.

The present invention should not be considered restricted by the above description, and a number of variants and modifications are feasible within the scope of the appended claims.

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<u>Reference numerals</u>	
Track	1
Opening	2
Means/flap	3
5 Receiving conveyor	4
Conveyor (supplying products to the track)	5
Front edge of the means/flap	6
Motor	10
Gear	12
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